

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2302

Roll No.

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B. Tech.

(SEM. II) THEORY EXAMINATION 2011-12

ELECTRICAL ENGINEERING

Time : 3 Hours

Total Marks : 100

Note :— Attempt all the three sections.**SECTION—A**

1. Attempt the following :— (2×10=20)

- (i) Is 'L' a linear element ? Explain the answer.
- (ii) If resistance of each branch is 3 ohms in a Delta connected load, what would be the resistance of each branch in its star equivalent ?
- (iii) Draw suitable waveforms to show the following :

$$v = V_m \sin \omega t; i = I_m \sin (\omega t + \theta)$$

Label the quantities suitably.

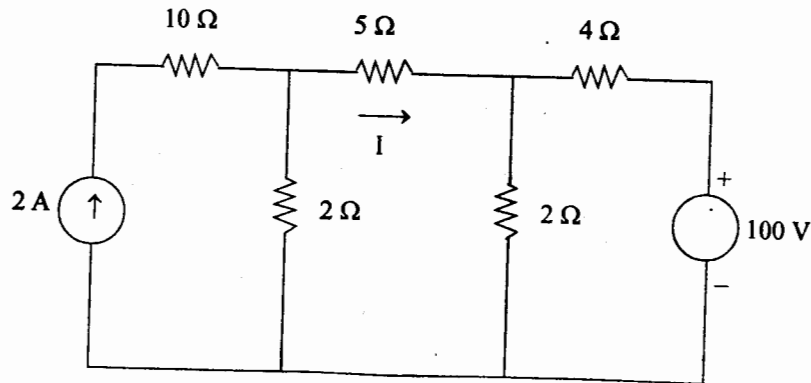
- (iv) For a series RLC circuit draw the phasor diagram and show the power factor angle in that. Assume the circuit draws inductive current.

- (v) Give the relationship between quality factor, resonant frequency and bandwidth for a series RLC circuit.
- (vi) What is the major difference between PMMC type and Dynamometer type of instruments ?
- (vii) Show the residual magnetism in a B-H curve.
- (viii) Name the constant losses taking place in a transformer.
- (ix) Name two motors used for constant speed operation.
- (x) Define the term "slip".

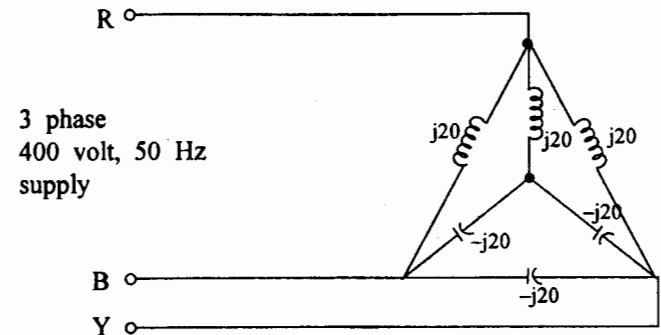
SECTION—B

Attempt any **three** of the following :— (10×3=30)

2. Apply Mesh analysis, obtain the current through 5 ohm resistance in the following circuit :



3. Voltages across R, L, C connected in series are 5, 8 and 10 volts respectively. Calculate the value of supply voltage at 50 Hz. Also find the frequency at which this circuit would resonate.
4. Find the current in phase R in the following circuit :



5. The maximum efficiency of a 100 kVA, 1100/440 volt, 50 Hz transformer is 96%. This occurs at 75% of full load at 0.8 pf lagging. Find the efficiency of transformer at $\frac{3}{4}$ FL at 0.6 p.f. leading.
6. The armature resistance of a 200 V DC shunt motor is 0.12 ohm. It runs at 600 rpm at constant torque load

and draws a current of 21 ampere. Calculate its new speed if the field current of the motor is reduced by 10%.

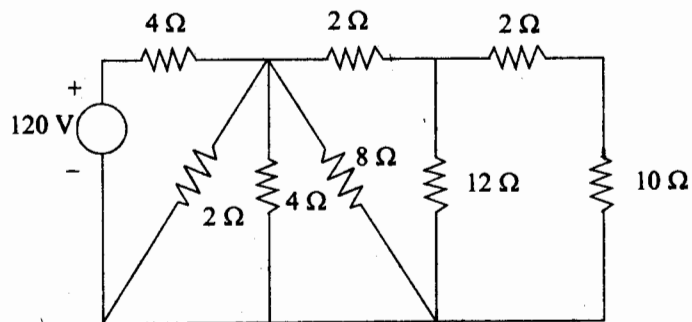
SECTION—C

Attempt **all** questions.

(10×5=50)

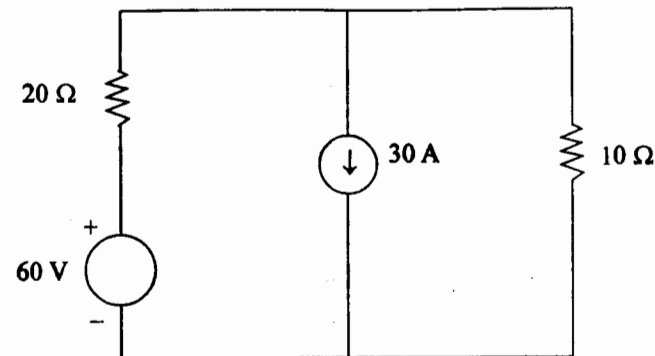
7. Attempt any **two** of the following :—

- (a) Find the equivalent resistance for the following circuit and hence calculate the current supplied by the source.



- (b) Explain the duality between a Thevenin's and a Norton's equivalent circuits.

- (c) Find the current flowing through $10\ \Omega$ resistance in the following circuit. Use Superposition theorem.



8. Attempt any **two** of the following :—

- (a) If load draws a current of 10 ampere at 0.8 p.f. lagging; when connected to 100 volt supply, calculate the values of real, reactive and apparent powers. Also find out the resistance of the load.
- (b) Deduce the formula for half power frequencies for a series RLC circuit under resonance. Why are they called 'Half power frequencies' ?

- (c) The two branches of a parallel circuit draw currents I_1 and I_2 such that $I_1 = 10\sqrt{2} \sin \omega t$ and $I_2 = 5\sqrt{2} \sin (\omega t - 60^\circ)$. What is the total current drawn by them ?

9. Attempt any **two** of the following :—

- (a) Discuss about induction type instrument in detail.
- (b) With the help of connection diagram and the related phasor diagram show that $w_1 + w_2$ gives the total 3ϕ power in a two wattmeter method of power measurement.
- (c) An ammeter has internal resistance of 2 ohms and it is designed to measure 1 amp. current. What would you do to make this meter read 15 ampere current ?

10. Attempt any **two** of the following :—

- (a) Draw and explain B-H curve. What is meant by saturation, coercive force, residual magnetism ? Show them in the diagram.
- (b) Write down the expression of efficiency for a transformer. How is it affected by change in power factor ?
- (c) Discuss in brief about Autotransformer.

11. Attempt any **two** of the following :—

- (a) Define 'Slip'. Discuss the principle of operation of 3ϕ Induction motor.
- (b) What do you know about splitting of phase in a single phase induction motor ? How does it help in starting the capacitor start single phase induction motor ?
- (c) Describe briefly the construction and working of a synchronous generator.